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FORT UNION COAL REGION

RENNER TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

MERCER COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

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INTRODUCTION

The purpose of this action is to offer the remaining 110.5 million tons of strippable unleased federal coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the Nation.

This site-specific environmental analysis has been prepared for the Renner tract (Map 1) in accordance with federal regulations (43 CFR 3420). Similar analyses have been written for other tracts of federal coal in the Fort Union Coal Region. These documents will be used by the regional coal team in determining which tracts to recommend for leasing in 1983. If selected and leased, the Renner tract would contribute 110.5 million tons of federal coal to the regional leasing target. A regional leasing target will be selected in October 1981.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office completed the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings county. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration of new competitive leasing, lease exchanges and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

BLM Dickinson district staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things certain unsuitability criteria were considered. Any new findings are reflected in this report.

Information from this and other site-specific analyses will be used by the Regional Coal Team during the tract ranking and selection process for determining lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Different combinations of tracts that meet a regional coal leasing target will be addressed.

After reviewing the analytical documents, public comments, and the recommendations of the regional coal team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered for leasing in accordance with the federal coal management program adopted by the Secretary of the Interior in June 1979. The basis for the program was, in part, the final environmental statement for the Federal Coal Management Program. Implementation procedures are contained in Federal Regulations (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

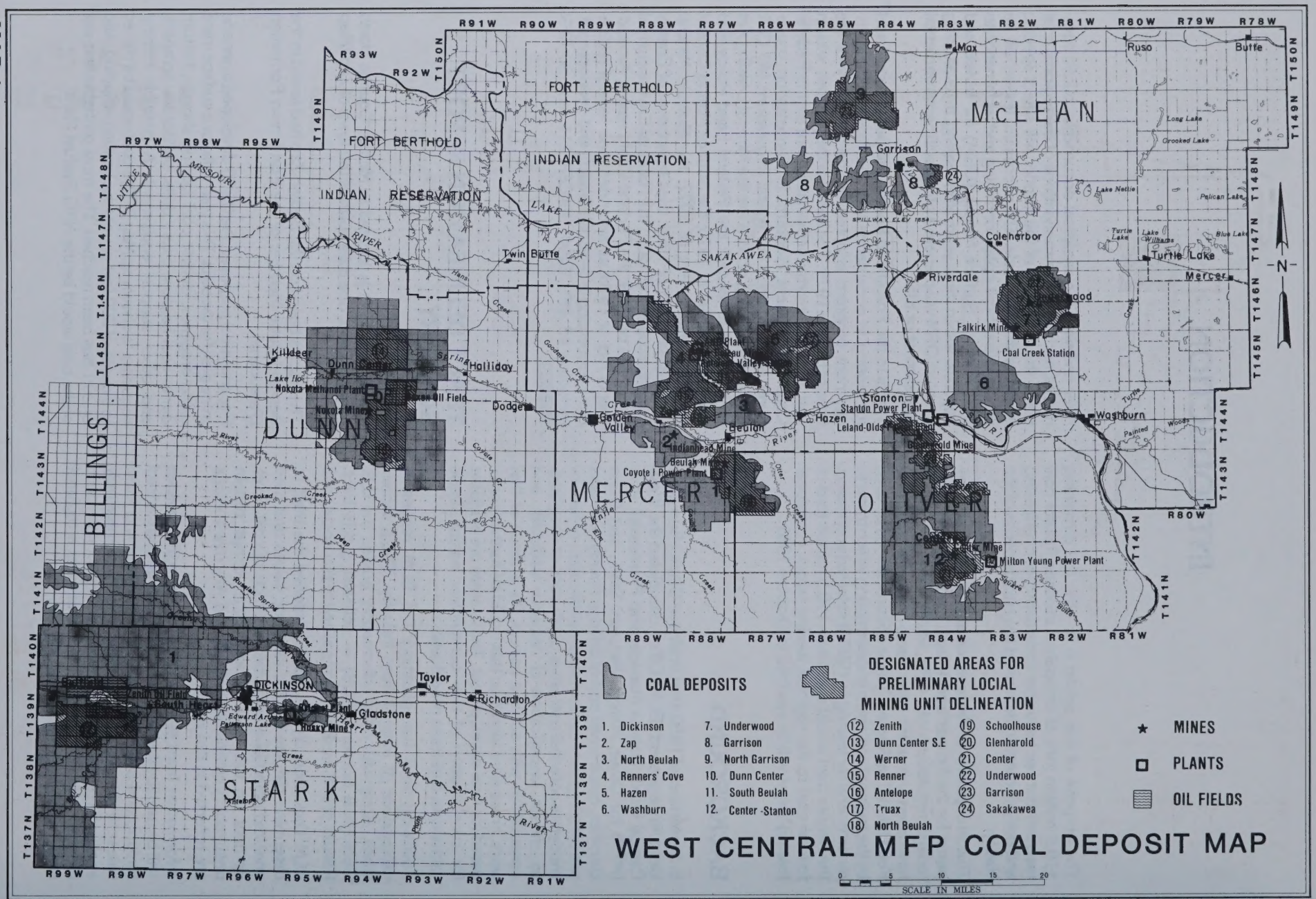
TRACT DELINEATION REPORT SUMMARY

The Renner tract is located in Mercer County, North Dakota, about one mile north of the town of Zap (Map 1).

The tract is based on the Beulah-Zap bed found in the Sentinel Butte Member of the Fort Union Formation (Paleocene).

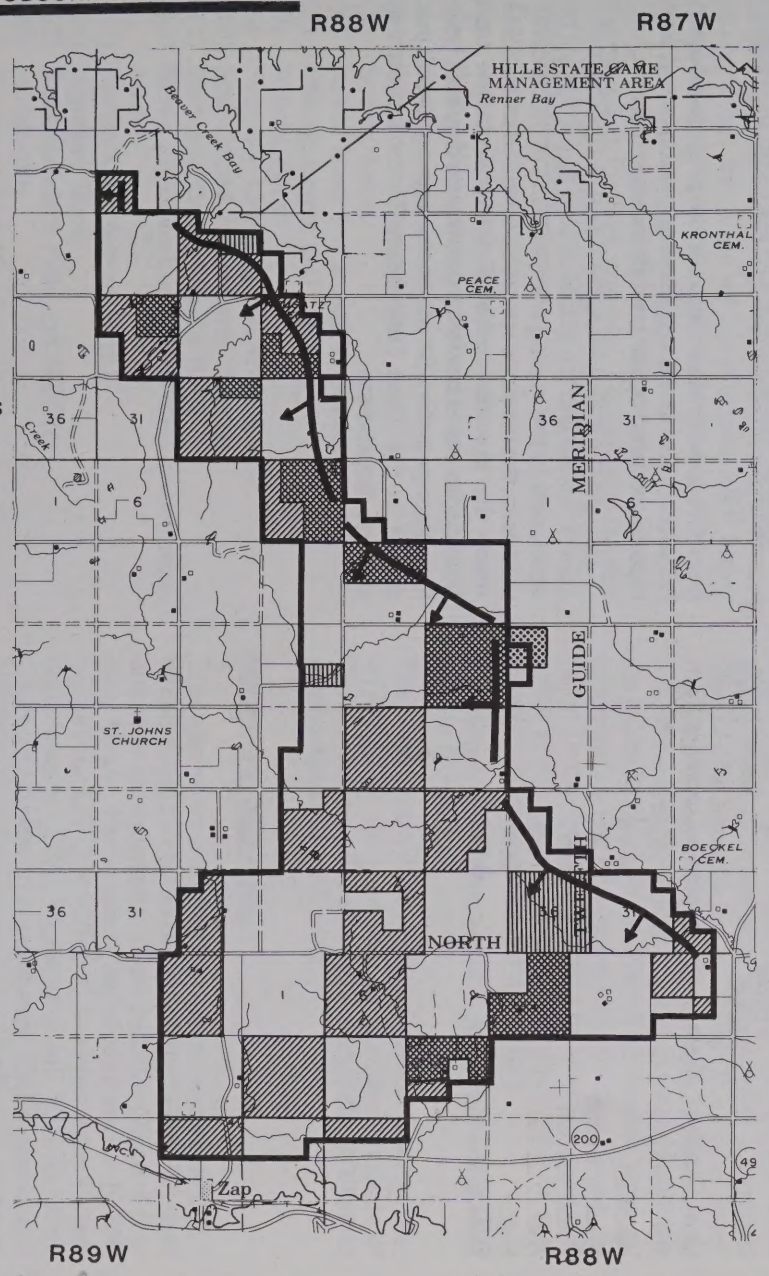
For analytical purposes, the USGS developed a generic mine plan for the tract. This plan calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers, rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be the ANG Synfuel Plant.

MAP 1

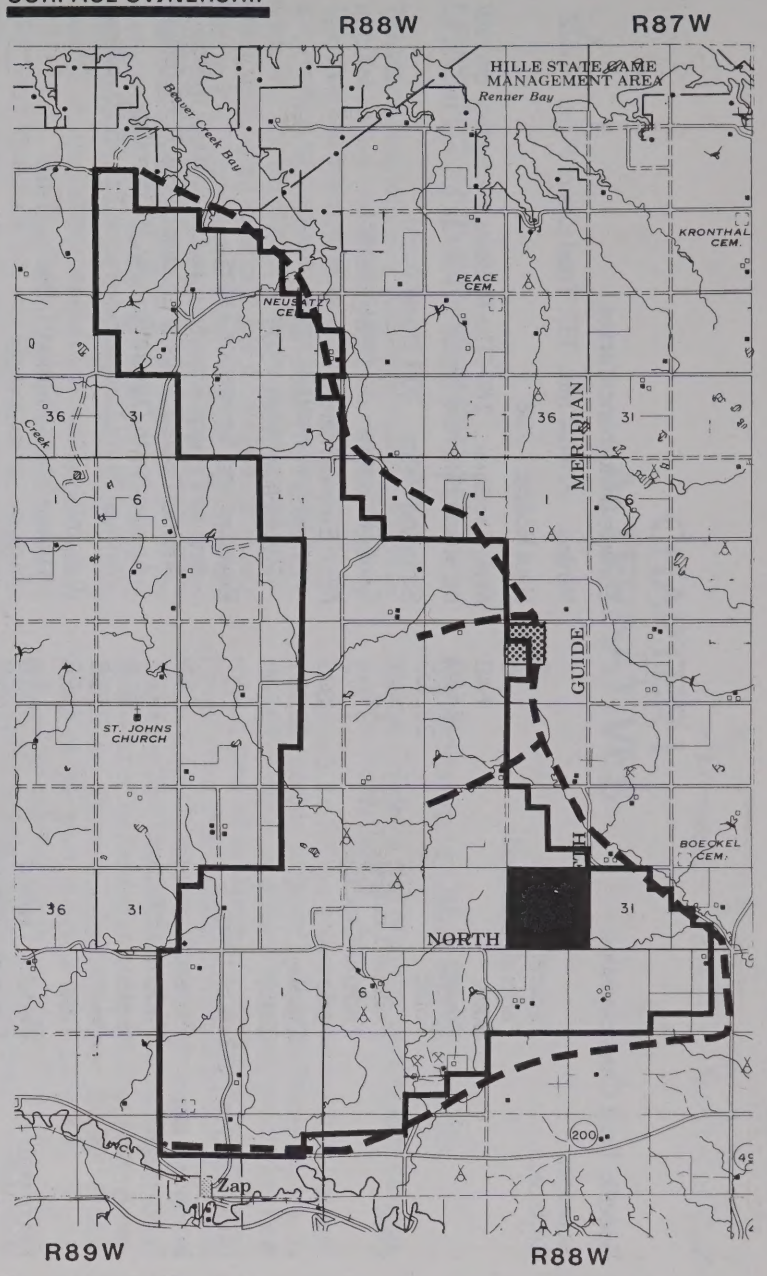


WEST CENTRAL MFP COAL DEPOSIT MAP

SUBSURFACE OWNERSHIP



SURFACE OWNERSHIP



LEGEND

- Tract Boundary
- Federal Coal
- Federal Coal Lease
- State Coal
- Private Coal
- State Surface
- Private Surface
- Surface Facilities
- Out-of-Pit Haul Roads
- Pit Advancement

RENNER TRACT

MAP 2

Outdated Tract Boundary

1 0 1 2 3 4 5 6
Scale In Miles

outdated tract boundary

Specific Tract Characteristics:

Acreage:

Surface:	Federal Leased	0
	Federal Unleased	0
	State	640
	Private	22,669
	Total:	23,309
Coal:	Federal Leased	1,757
	Federal Unleased	7,775
	State	1,840
	Private	11,937
	Total	23,309

Coal Reserves/Millions of Tons:

In Place:	Federal Leased	56.4
	Federal Unleased	122.8
	State	23.8
	Private	253.6
	Total	456.6
Recoverable:	Federal Leased	50.8
	Federal Unleased	110.5
	State	21.4
	Private	228.2
	Total:	410.9

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.1%
Volatile matter	27.2%
Fixed carbon	30.5%
Ash	6.2%
Sulfur	0.8%
BTU's/lb	6,919

Surface Disturbance/acres

Mining: Annual rate, 387; Total Life of Mine, 17,422

Haul Roads: 298

Mine Facilities: 160 (The facilities are in place and will be shared with the Antelope tract.)

Stripping Ratio: 20:1 (maximum)

Coal Thickness: 15 feet (average)

Mine Employment:
Construction Phase - 225
Production Phase - 300

Royalties and Severance Taxes:
Annual Federal Royalty leased coal, $0.19 million
Annual Federal Royalty unleased coal, $1.81 million
Annual North Dakota Royalty, $0.35 million
Annual North Dakota Severance Tax, $8.10 million

Water Needs:
Human Consumption, 9,000 gal./day
Source: Well water

Nonpotable, 270,000 gal./day
Source: The synthetic fuel plant and pit dewatering

For more specific information on the proposed mining operation, refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the resource specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

This alternative is to offer the federal coal in the Renner tract for further consideration for competitive leasing. This tract has been identified as a logical mining unit for a 9.0 million ton per year surface mine having a 45 year mine life. The Renner tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota Management Framework Plan (MFP) adopted in September 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 19 and 20 as defined in 43 CFR 3461. Criteria 9, 14, and 15 require further study. With the exception of criterion 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact study; if not, this tract will be dropped from futher consideration. Criterion 3 will be deferred until mining and reclamation plans are submitted to the Office of Surface Mining and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Mercer County is the center of coal energy development in North Dakota.

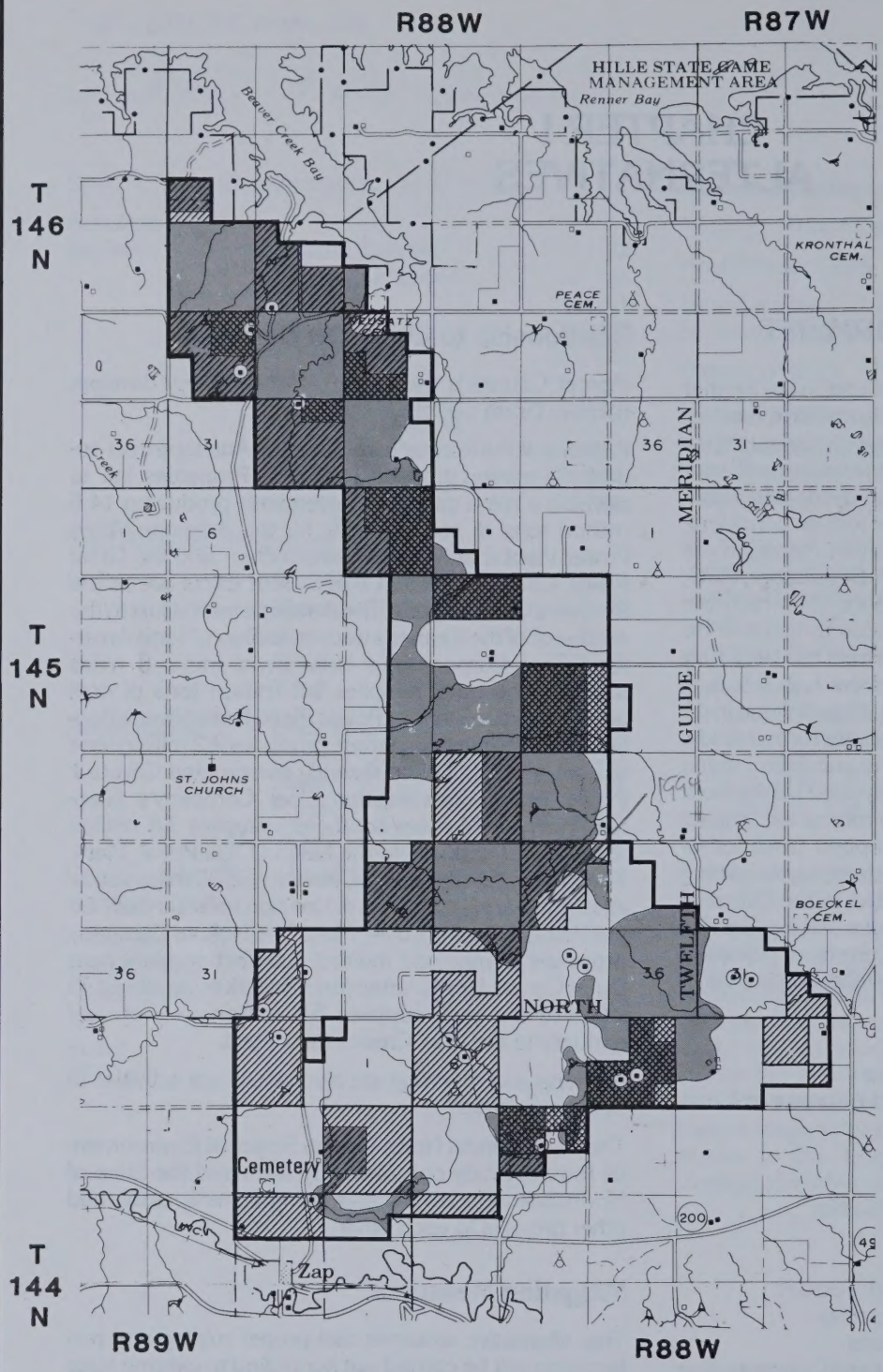
Portions of the Renner's tract and the Antelope tract are part of a mining proposal by Coteau Properties, Inc. to develop a mine capable of eventually producing 14.6 million tons of coal annually for the Antelope Valley Power Plant that is under construction and the Great Plains Coal Gasification Plant. Both tracts are in the Renner's Cove Deposit. The Antelope tract is just to the northeast of the Renner's tract. In addition, North American Coal Corporation's Indianhead mine, 8 miles south of the tract, supplies 1.2 million tons of coal annually to the Stanton Power Plant. Knife River's Beulah mine, 15 miles southeast, produces 2.2 million tons of coal annually for the recently constructed Coyote 1 Power Plant. Consolidation Coal Company's Glenharold mine, 24 miles southeast, supplies 3.8 million tons of coal annually to the Leland Olds Power Plant. The Baukol Noonan, Inc.'s Center mine, 35 miles southeast of the area, produces 4.1 million tons annually for the Milton R. Young Power Plant. The Nokota Company proposes a mine and indirect liquefaction plant near Dunn Center. North American's Falkirk mine, about 25 miles to the east, supplies 5.6 million tons of coal annually to the Coal Creek Power Plant.

Farming and ranching are also significant activities in or near the tract.

The West-Central North Dakota Regional Environmental Impact Study completed by BLM and the State of North Dakota in 1978 shows the relationship of this and other projects to each other.

Mitigation Measures

This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (OSM) regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Council of Environmental Quality (CEQ) regulations (40 CFR 211), Department of Interior's coal management regulations (43 CFR 23 and 3400), and North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).



LEGEND

- Federal Coal
- Federal Coal Lease

Areas being considered as unsuitable by BLM and others based on existing information.

- Wildlife Habitat
- Potential Dwellings

(Rights-of-way too numerous to show.)

Note: Detailed maps are available for inspection at the Dickinson BLM District Office.

N

1 0 1 2 3 4 5 6

Scale In Miles

RENNER TRACT

MAP 3

NO LEASING ALTERNATIVE

Federal coal would not be offered for lease under this alternative. The tract contains 110.5 million tons of recoverable federal coal which represents about 27 percent of the total recoverable reserves. A total of approximately 51 million tons of federal coal has been leased to Coteau Properties, Inc. in 1961 and 1967. It is also assumed that if the remaining unleased federal coal in this tract is not leased, a large-scale economic mine probably could not be established. This would lessen interest in the tract and reduce competitive leasing. The private and state coal could support several smaller mines; however, no interest was shown for a smaller mine in this area by companies filing expressions of leasing interest.

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and this trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

This tract is located within the glaciated portion of the Missouri Plateau which is a part of the Great Plains physiographic province. The area is primarily rolling upland with an approximate maximum relief of 300 feet. It is bounded on several sides by entrenched valleys.

GEOLOGY AND MINERALS

The tract is underlain by about 500 feet of yellow-brown to gray, fine to medium-grained sandstone, interbedded gray and brown clay and siltstone, gray bentonitic clay beds, and lignite beds which collectively make up the Sentinel Butte member of the Fort Union Formation.

The only extensive economically mineable bed found in this tract is the Beulah-Zap bed found in the Sentinel Butte Member. This bed averages about 15 feet thick. In place tonnage is about 456.6 million tons, of which about 179.2 million tons are Federal, 253.6 million tons are fee, and 23.8 million tons are state owned.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

Most of the soils in the Renner tract have formed in a thin mantle of glacial till (Williams, Zahl) and from residual shale and sandstone (Cabba, Cohagen, Vebar). There are also some soils formed in alluvium (Straw, Arnegard) and baked clays (Ringling).

The Williams soil mapping units generally occupy the rather gently sloping uplands. The alluvial soils such as Straw and Arnegard are found primarily along nearly level to gently sloping drainageways. These soils characteristically are deep, well-drained, loamy and of medium to high natural fertility.

The Cabba, Cohagen, and Ringling mapping units dominate the strongly to steeply sloping breaks from the uplands into the drainageways. They are shallow, well drained, loamy, and coarse-loamy soils of low natural fertility.

The water erosion hazard is high over much of this tract because of the intensive steep slopes. The wind erosion potential is primarily high on the mapping units with fine sandy loam textures (Table 1).

The quality of soil within the tract is reflected in the soil suitability for final cover of surface mined land ratings and acreage figures. By planimetering the soil mapping units according to their rating, it was determined that about 10,293 acres or 44 percent of the tract is in the "good" suitability category; 10,669 acres, 46 percent "fair;" and 2,278 acres, 10 percent "poor." The Williams and to a lesser extent, Straw and Arnegard mapping units comprise most of the acreage rated "good." The acreage rated "fair" is dominated by the Cabba and Cohagen mapping units. The Ringling and to a lesser extent, Rhoades units make up most of the "poor".

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE RENNER TRACT

LANDOWNER NUMBER	ACRES			
	GOOD	FAIR	POOR	TOTAL
1a	17	55	48	120
b	119	314	87	540
2	67	54	39	160
3a	24	136	0	160
b	63	97	0	160
4	20	18	2	40
5	50	110	0	160
6	14	66	0	80
7a	125	35	0	160
b	376	326	58	760
8	2	158	0	160
9	187	124	9	320
10	677	352	91	1,120
11	0	80	0	80
12	83	77	0	160
13a	51	88	21	160
b	145	187	28	360
c	38	2	0	40
14	16	49	15	80
15	43	93	24	160
16	33	47	0	80

TABLE 1
RENNER TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
1 - Parnell silt loam	0-1	Low	Low	Good	----
2 - Tonka silt loam	0-1	Low	Low	Good	----
8 - Grail silty clay loam	1-3	Low	Low	Fair	Too clayey
8B - Grail silty clay loam	3-6	Low	Mod	Fair	Too clayey
9B - Regent silty clay loam	3-6	Low	Mod	Fair	Too clayey
9C - Regent silty clay loam	6-9	Low	High	Fair	Too clayey
10 - Savage silty clay loam	1-3	Mod	Mod	Fair	Too clayey
17 - Heil silty clay loam	0-1	Low	Low	Poor	Too clayey, excess sodium
27B - Mandan silt loam	3-6	Mod	Low	Good	----
35C - Amor-Werner loams	6-9	Low-Mod	Mod	Good	----
35D - Amor-Werner loams	9-15	Low-Mod	High	Good	----
36 - Williams loam	1-3	Low	Low	Good	----
36B - Williams loam	3-6	Low	Low	Good	----
36C - Williams loam	6-9	Low	Mod	Good	----
38C - Williams-Zahl loams	6-9	Low-Mod	Mod	Good	----
38D - Zahl-Williams loams	9-15	Low-Mod	High	Fair	Too clayey, some lime
38E - Zahl loam	15-35	Low-mod	High	Fair	Too clayey, some lime

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40 - Shambo loam	1-3	Low	Low-Mod	Good	----
40B - Shambo loam	3-6	Low	Low-Mod	Good	----
41B - Parshall loam	1-6	Mod	Low-Mod	Good	----
44 - Arnegard loam	1-3	Low	Low	Good	----
44B- Arnegard loam	3-6	Low	Mod	Good	----
44C - Arnegard loam	6-9	Low	Mod-High	Good	----
51 - Straw silt loam	0-1	Low	High	Good	----
55C - Vebar fine sandy loam	6-9	High	High	Good	----
56B - Lefor fine sandy loam	1-6	High	Low-Med	Good	----
56D - Lefor fine sandy loam	6-12	High	High	Good	----
58B - Flaxton-Williams complex	3-6	Mod-High	Low	Good	----
58C- Flaxton-Williams complex	6-9	Mod-High	Mod	Good	----
67 - Straw soils, channeled	0-1	Low	High	Good	----
71B - Searing loam	1-6	Mod	Low	Good	----
71C - Searing-Ringling loams	6-9	Mod	Mod	Fair	Ringling-excess rock fragments

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RENNER TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
73 - Belfield silt loam	1-3	Low	Low	Fair	Clayey subsoil with sodium & salts
74B - Regent-Rhoades complex	1-6	Low	Low-Mod	Fair	Too clayey, Rhoades-excess sodium & salts
74C - Regent-Rhoades complex	6-9	Low	Mod-High	Fair	Too clayey, Rhoades-excess sodium & salts
75 - Belfield-Daglum silt loams	1-3	Low-Mod	Low	Fair	Clayey subsoil some sodium & salts
75B - Belfield-Daylum silt loams	3-6	Low-Mod	Mod	Fair	Clayey subsoil, some sodium & salts
76B - Sen-Rhoades complex	3-6	Low-Mod	Low-Mod	Fair	Rhoades-too clayey, excess sodium & salts
76C - Sen-Rhoades complex	6-9	Low-Mod	Mod-High	Fair	Rhoades-too clayey, excess sodium & salts
77 - Bowdle loam	1-3	Mod	Low	Good	----
77B - Bowdle loam	3-6	Mod	Mod	Good	----
79C - Moreau silty clay	6-9	High	High	Poor	Too clayey; some sodium in subsoil
81D - Cabba loam	9-15	Mod	High	Fair	Too alkaline, some lime
81E - Cabba loam	15-35	Mod	High	Fair	Too alkaline, some lime
82E - Cabba-Badland complex	15-50	Mod	High	Poor	Cabba-too alkaline, some lime Badland-lack of soil

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RENNER TRACT - SOILS

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83C - Vebar-Cohagen fine sandy loams	3-9	High	High	Good	----
83E - Cohagen-vebar fine sandy loams	9-35	High	High	Fair	Cohagen-too alkaline
84E - Cohagen-Vebar rock outcrop complex	9-50	High	High	Fair	Cohagen-too alkaline, rock outcrop no soil
86E - Wabek soils	3-25	Mod-High	High	Poor	Excess small stones, droughty, sandy subsoil
87C - Rhoades-Daglum complex	1-9	Low	Mod	Poor	Too clayey, excess sodium & salts
88 - Harriet clay	0-1	Mod-High	Low	Poor	Too clayey, excess sodium & salts
91 - Straw loam	0-6	Low	High	Good	----
92B - Noonan-Williams loams	1-6	Low	Mod	Fair	Noonan-excess sodium
93 - Falkirk loam	1-3	Low	Low	Good	----
94 - Makoti silt loam	0-1	Low	Low	Good	----
97B - Sen silt loam	3-6	Low	Mod	Good	----
97C - Sen silt loam	6-9	Low	High	Good	----
98E - Ringling-Cabba complex	9-35	Mod	High	Poor	Ringling-excess rock; Cabba-too alkaline, some lime
100C - Amor loam	6-9	Low	Mod	Good	----

TABLE 1
RENNER TRACT - SOILS

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
101C - Parshall fine sandy loam	6-9	High	High	Good	----
102 - Bowbells loam	1-3	Low	Low	Good	----
109B - Bowbells-Zahl loams	3-6	Low-Mod	Low-Mod	Good	----

1/ From "Soil Survey of Mercer County, North Dakota"

2/ Derived by applying the properties of the soils which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS) and the Office of Surface Mining (OSM).

LANDOWNER NUMBER	ACRES GOOD	FAIR	POOR	TOTAL
17	104	157	19	280
18a	121	39	0	160
b	81	79	0	160
c	134	21	5	160
19a	107	53	0	160
b	155	165	0	320
20a	211	60	9	280
b	7	218	55	280
c	24	136	0	160
21	98	45	17	160
22a	12	138	10	160
b	146	171	3	320
23	222	178	0	400
24	52	108	0	160
25a	27	13	0	40
b	76	170	74	320
c	105	119	96	320
d	65	95	0	160
e	28	132	0	160
26	211	427	2	640
27a	112	200	8	320
b	110	41	9	160
28a	74	114	92	280
b	62	136	42	240
30a	232	190	138	560
b	463	177	0	640
31	114	166	0	280
32a	204	194	2	400
b	67	102	31	200
34a	82	40	38	160
b	133	81	66	280
37*	31	41	88	160
38	57	23	0	80
39a	16	64	0	80
b	139	21	0	160
c	276	204	0	480
40a	386	254	0	640
b	24	295	1	320
41a	397	243	0	640
b	41	39	0	80
42	52	64	44	160
43a	234	286	160	680
b	148	241	91	480
44a	96	64	0	160
b	39	41	0	80
45a	44	69	7	120
b	92	51	17	160
46a*	9	14	57	80
b	1	79	0	80
c	131	63	86	280
d	43	117	0	160
48	71	197	12	280
49a	68	42	10	120
b*	43	103	174	320
c*	86	27	167	280
50	78	2	0	80
51	188	132	0	320
52	438	193	9	640
53a	83	77	0	160
b	190	130	0	320
c	105	55	0	160
55a	324	116	0	440
b	101	69	70	240
56	29	161	10	200
57	92	96	92	280
58	42	32	8	80
59	45	25	10	80
60	48	112	0	160
TOTALS	10,293	10,669	2,278	23,240
% OF TOTAL	44%	46%	10%	100%

1/ Based on Table 1 Planimetry by BLM. Legal description of land and owner name corresponding to landowner number available at Dickinson District Office. Individual landowner holdings that are not contiguous are depicted separately by small letters.
*Indicates tract that has nearly half or more of the acreage rated "poor" for use as cover soil material in surface-mine reclamation.

Acreages are developed by landowners in Table 2 because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his respective holdings. The Table therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability for cover of surface-mined land.

HYDROLOGY

Surface water runoff drains from this tract through a tributary of Antelope Creek which flows to the Knife River, several direct tributaries to Lake Sakakawea at Beaver Creek Bay, and several direct tributaries of the Knife River. Annual runoff in this area averages about one inch. Table 3 shows the percentage of these watershed areas covered by the tract plus the additional area disturbed by facilities, haul roads, etc. Also shown are estimates of water yield.

TABLE 3
WATERSHED AREAS ON THE RENNER TRACT

Watershed	Area (miles²)	% of Watershed to be Disturbed	Annual Water Yield (acre-feet)
Direct Trib. Lake Sakakawea	16.5	73	880
Trib. to Antelope Creek	28.3	58	1509
Direct Trib. Spring Creek	29.0	52	1547

The surface water is typically a sodium sulfate type. Impounded surface water within the affected area consists of stockwater ponds located primarily in the upper parts of the watersheds. Some small seeps occur along outcrops of lignite at the east and southern edges of the tract.

In ascending order above the Pierre Shale, the Fox Hills—Basal Hell Creek, upper Hell Creek—lower Ludlow, lower Sentinel Butte sand, Antelope Creek, and Beulah-Zap lignite are aquifers that occur beneath this tract. The Beulah-Zap lignite and Antelope Creek buried valley form aquifers within the mine disturbance zone.

The Beulah-Zap lignite receives recharge through infiltration of precipitation and ponded water. The flow pattern for this aquifer reflects topographic controls. Water discharges along the east side of the tracts into the Antelope Creek valley as subsurface flow, through seeps and springs in other outcrop areas and through leakage to lower aquifers.

The Antelope Creek Aquifer occurs in a buried glacial meltwater channel which extends from Lake Sakakawea to the Knife River along the east edge of the tract. There is an upper zone and lower zone in this system. The upper unit is recharged by infiltration from the surface and lateral inflow from the Beulah Zap lignite. A groundwater divide for the upper unit is located near section 13 of Township 145 Range 88. When Lake Sakakawea is at high stages there is some recharge to this aquifer from the Lake. The lower zone receives recharge from the upper zone, laterally from the Sentinel Butte sand and from Lake Sakakawea. The lower zone discharges to the south.

The Sentinel Butte sand aquifer lies between 150 and 200 feet below the Beulah Zap lignite. Flow through this aquifer appears to be controlled by the level of Lake Sakakawea. There is also a close connection between the lower unit of the Antelope Creek Aquifer and the Sentinel Butte sand.

Water quality in the lignite varies from a calcium sulfate-bicarbonate type to a sodium bicarbonate type. The Sentinel Butte sand Aquifer quality is a bicarbonate type. Antelope Creek water quality is highly variable.

Groundwater in and surrounding the tract is used for domestic and stock watering, irrigation and industrial purposes. Most of this use is from the shallow aquifers.

The irrigation water supply comes from the lower zone of the Antelope Creek Aquifer. The industrial use is for the mining and power generation facilities already present and comes from the Antelope Creek Aquifer, Lake Sakakawea and some mine pit dewatering.

VEGETATION AND AGRICULTURAL PRODUCTION

The Renner tract is extensively used for agricultural purposes. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Five percent (1,033 acres, Mercer County ASCS, 1981) is fallowed each year (Table 4).

TABLE 4
AGRICULTURAL LAND USE
ON THE RENNER TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	3,673	25.0 bu.	91,825 bu.
Hayland	1,701	1.35 tons	2,296 tons
Range	15,665	.5 AUM	7,833 AUMs
Other	0	1.35 tons	0 tons
Fallow	1,033	n/a	n/a
Total	22,072	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre hay
Range : AUMs/acre
Other : tons/acre of hay equivalent

Small grains including spring wheat, oats, corn, barley, winter wheat, durum, flax, and sunflowers (in descending order of acreage grown) are grown on 16 percent (3,673 acres) of the tract. Wheat yields average 25 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn are also used as feed grains in livestock operations.

Eight percent (1,701 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.35 tons of hay are produced per acre.

Seventy-one percent (15,665 acres) is rangeland and pastureland. Rangeland produces about .5 AUM's per acre. (An Animal Unit Month is the amount of forage needed to support a cow/calf for one month.) Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service, 1980). There are also some dairy cattle, hogs, and sheep.

There are some preparations being made for the introduction of irrigation operations into the area in the forseeable future.

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. Numerous woody draws in the tract are populated by native trees and shrubs.

Except for reseeded areas, the rangeland is in the widespread Mixed Grass Prairie type (Shaver, J.C. 1977). This includes species such as needle and thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plains muhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species as published on the 1980 federal list have been identified in the tract.

There are 40 operators and operator partnerships in the tract (Table 5). Operations range in size from 40 acres to 1,712 acres inside the tract and from 160 acres to 5,374 acres in total. Sixty percent of the operations have less than 50 percent of their operations within the tract while 30 percent have more than 80 percent of their acreage within the tract. Overall, the tract covers 39 percent of the acreage of the operations involved.

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

Twenty-six percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Seventy-four percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The Renner project area is presently used for dryland cropping of wheat, hay and barley and for grazing. Land use in the vicinity of the tract is primarily agricultural but coal mining is becoming a major land use. A large coal fired power plant is under construction on the east boundary of the tract and a synthetic fuel plant is being contemplated as a future use in the vicinity. Minor uses of the tract include roads and utility lines. The most important of the roads is State Highway 200, just within the southernmost boundary of the tract running north of the town of Zap.

The towns of Zap and Beulah are the main centers of population in the vicinity. These towns have been influenced by existing mining and increased population. The tract, under Mercer County planning is agricultural but special permits are issued to permit mining.

RECREATION

Hunting of a variety of species (deer, upland game birds, waterfowl) is the main recreational opportunity on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The communities of Zap and Beulah, North Dakota offer recreational opportunities in the vicinity of the tract. Ballfields, playgrounds, parks and gymnasium facilities along with a swimming pool offer opportunities judged adequate by community leaders at this time. State and federal lands along Lake Sakakawea, north of the tract, offer recreational opportunities.

AESTHETICS

The existing character of the land is largely agricultural as noted in other sections of this document. The appearance of the area is constantly changing following the progression of agricultural activity through the seasons and the cycle of active cropping and fallow through periods of years. Fields are well defined rectangles in a north/south, east/west grid divided by roads on most section lines and also by wind rows, fences and shelterbelts. Interspersed variations such as small patches of broken ground, grazed prairie and woody draws can be found in the tract area.

Man-made features are a part of the character of the landscape. In the vicinity of this tract a gravel pit, power lines, a railroad right of way and agricultural structures and facilities are evident. In the region, coal mining is evident and is accepted locally as part of the land.

Little of the tract is visible from the town of Zap but the tract area is highly visible from State Highway 200. Portions of the tract are visible from the highway for several minutes in the westbound direction and from both eastbound and westbound where the highway crosses the southwest corner of the tract. From State Highway 200 eastbound the view of the tract is limited, at typical highway speeds, to approximately four minutes at a comfortable viewing angle.

WILDLIFE

The northern half of this area is the broken topography of the Missouri River (Lake Sakakawea) valley. Numerous dissected, often deeply incised, streamcourses flow north into Beaver Creek and the reservoir. Native woodlands encompassed by native prairie are common and provide the essential habitat for 31 sensitive and numerous more common wildlife species. Wetlands are primarily riparian wetlands along streamcourses bounded by woodlands and native prairie.

The southern part of the area is less dissected, and drains south into Spring Creek. Woodlands along streamcourses encompassed by native prairie are common.

Essential wildlife habitats represent the following percent of the 23,506-acre area: wetlands—1.7 percent; woodlands—5.1 percent; native prairie—59.3 percent; and non-essential habitat agriculturally disturbed—33.9 percent.

Whooping crane, an endangered species, migrate through this area annually (Table 6).

It is the interspersion of essential habitats that provides the greatest amount of edge, has the highest wildlife habitats, and largest populations. The remnant wildlife habitats, either singly or interspersed, are the result of 60 to 70 years of intensive farming of all suitable land, with limited exception. These residual wildlife habitats are the best habitat of what is left in the area.

TABLE 5

FARM/RANCH OPERATIONS - RENNER TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	100	0	361	29	0	520	61	0	0	0	0	0	0	520	100
2	124	57	99	0	0	280	100	0	0	0	0	0	0	280	100
3	0	0	240	0	0	240	0	395	186	372	87	0	1040	1280	19
4	0	72	408	0	0	480	33	511	136	274	254	0	1175	1655	29
5	0	0	160	0	0	160	100	172	101	685	2	0	960	1120	14
6	149	80	953	120	0	1302	100	490	162	1031	153	0	1836	3138	41
7	372	17	660	102	0	1160	100	642	121	655	244	0	1662	2822	41
8	32	41	239	8	0	320	50	1010	444	3343	257	0	5054	5374	6
9	0	0	440	0	0	440	100	0	0	0	0	0	0	440	100
10	125	47	1058	18	0	1712	35	120	0	63	17	0	200	1912	90
11	49	24	253	3	0	329	97	109	22	535	5	0	671	1000	33
12	48	0	6	26	0	80	100	294	99	1034	173	0	1600	1680	5
13	97	93	290	0	0	480	0	0	62	9	0	0	71	551	87
14	65	24	386	5	0	490	100	434	68	405	173	0	1080	1570	31
15	294	107	703	16	0	1120	0	97	54	9	0	0	160	1280	80
16	69	31	60	0	0	160	100	811	586	1213	195	0	2799	2959	5

TRACTS (ACRES)

GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
581	14	0	920	1720	47
625	95	0	1280	1440	11
42	0	0	120	160	25
617	40	0	800	1360	41
1056	252	0	1954	3304	44
199	31	0	400	720	88
22	22	0	800	672	100
0	0	0	1954	320	34
343	150	0	400	1160	100
0	0	0	80	640	100
0	0	0	0	640	100
0	0	0	0	880	100
269	31	0	491	1091	55
61	68	0	332	1532	78
1007	118	0	1640	1960	16

TABLE 5

FARM/RANCH OPERATIONS - RENNER TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
32	71	0	195	7	0	273	0	290	114	482	110	0	998	1271	21
33	250	48	983	117	0	1398	80	260	76	357	260	33	560	1958	71
34	42	56	331	11	0	440	36	176	87	334	43	0	640	1080	41
35	32	0	30	18	0	80	100	181	3	229	107	0	520	600	13
36	100	17	137	53	0	307	0	227	53	506	107	0	893	1200	26
37	95	24	322	39	0	480	100	994	25	716	415	0	2150	2630	18
38	13	60	397	10	0	480	100	87	0	246	147	0	480	960	50
39	16	32	225	7	0	280	100	29	0	0	11	0	40	320	88
40	36	56	608	22	0	722	0	0	10	190	0	0	200	922	78
TOTAL	3673	1701	15,665	1033	0	22,072	26	9750	3028	17,510	3581	33	33,902	55,974	39

Wetlands, specifically prairie potholes, are the most productive wildlife habitats in North Dakota.

Native grasslands represent relics of the original prairie ecosystem. Unplowed prairie is only 20 percent of the original North Dakota total.

The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has disturbed some of the earlier cultural sites.

TABLE 6
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

There are no sensitive fish, amphibians, or reptiles identified in this area at this time. There are sensitive fish in the Garrison reservoir, and the Missouri River and Spring Creek downstream of the area.

CULTURAL RESOURCES

Fifty-two percent of the total surface of the tract has been the subject of intensive cultural resources inventory. Over federal coal 49 percent of the surface has been the subject to the same inventory. This inventory has produced habitation sites as well as open plains task-specific and exploitative sites (i.e., bison kill sites; lithic scatters of varying size, density and function; seasonal and long term habitation sites).

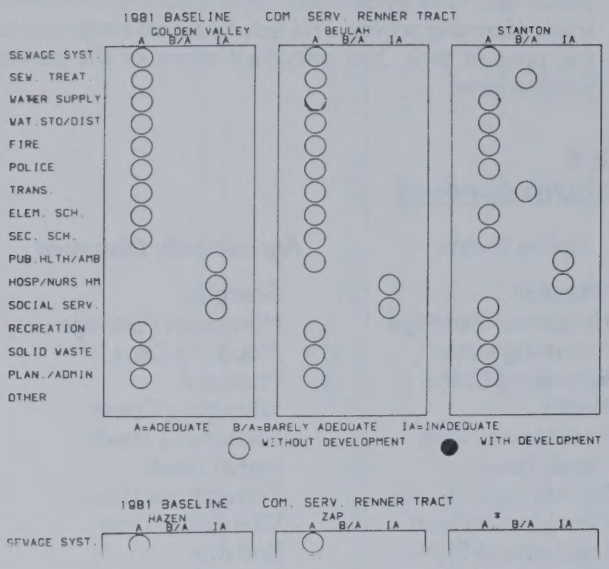
The rolling plains between the Knife and Missouri Rivers is an ideal location for the short term cultural occupation sites. Short trips to exploit a variety of natural resources from the area is evidenced in the pattern of recorded prehistoric sites found on and near the tract.

ECONOMIC AND SOCIAL CONDITIONS

Existing and forecasted population and employment levels for the communities of Beulah, Golden Valley, Hazen, Stanton, and Zap, North Dakota are shown in Figure 3, Chapter 3 (Population and employment forecasts: Mountain West 1981). As these figures show, future population levels without the leasing of federal coal are expected to increase and decrease significantly influctuations due to the construction of energy projects not directly related to federal coal leasing.

Figure 1 shows the present (1981) condition of public services in Beulah, Golden Valley, Hazen, Stanton, and Zap. As Figure 1 shows, all communities presently have one or more public services that are currently considered to be inadequate. For example, Hazen has inadequate social services for its present population.

FIGURE 1



Officials in Mercer County were equally supportive of expanded coal mining in the local area. No interviewed official expressed opposition to additional mining while five of the six supported it, either without reservation or with some qualification. The reasons listed by these officials include availability of a natural resource, the nation's energy needs, area needs for employment, and the likelihood of orderly development. The concerns of these officials were typically focused on the potential problems attached to population growth. Access to adequate revenues, providing adequate education resources, along with a changed pace of life, emerged as significant concerns. Also, as in the general population, reclamation and potential air pollution were raised as mining issues by officials.

Mercer County residents listed both natural and social features of the area as favorable attributes. Outdoor recreation opportunities and attachment to the land were characteristics appreciated by persons in the area. The social environment (uncrowded, informal and unstressful) was mentioned as a favorable characteris-

TABLE 7*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Beulah	Center	Washburn	Dunn Center	Bismarck (WSO)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	40.6	40.5	41.9	40.2	41.4	40.6
$\bar{X}$ monthly low (Jan)	7.6	8.5	8.2	7.9	8.2	8.4
$\bar{X}$ monthly high (July)	69.3	69.0	70.8	68.7	70.8	69.4
Average growing season (temp. 32° F), days	121	117	133	122	133	120
Precipitation, in.						
Annual average	17.20	17.45	18.01	16.57	15.15	16.91
Monthly range	0.32-3.35	0.48-3.55	0.35-4.11	0.36-3.72		0.40-3.92
Annual snowfall	27	29.8	30	34	40	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					14.3	
Class D					56.4	
Class E, F					29.3	
Wind direction, (%)					W-NW(28)	
Wind speed, mph (% of time)					0-3.5 (4)	
					3.6-6.9 (13.4)	
					7-11.5 (30.5)	
					11.6-18.4 (39.1)	
					18.5-24 (11.3)	
					24 (1.6)	
Average wind speed, mph					10.8	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Agriculture 1978.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

TABLE 8
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

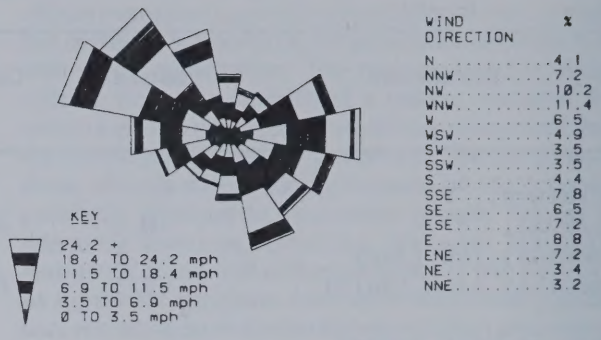
*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

Precipitation in the area occurs predominantly in the late spring and early summer (May to July). Annual precipitation averages 17.20 inches at Wibaux, and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Beulah station is 27 inches.

Wind data used for this analysis were obtained from the Bismarck climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 2 represents a summary of this data. Winds prevail from the WNW to NNW at Bismarck (29 percent frequency of occurrence). Wind speeds average 10.2 mph and exceed 11.5 mph 36 percent of the time.

FIGURE 2



WIND ROSE FOR BISMARCK NORTH DAKOTA

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum L. J., J. W. Enz and J. M. Ramirez 1978).

Table 9 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m^3 (at Garrison) to 32 ug/m^3 (at Beulah, rural). From 1974 to 1980 the annual geometric mean concentration of TSP at the Beulah residential monitoring station ranged from 28 to 61 ug/m^3. For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 9
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Beulah (residential)	74	TSP	32	1781	161	28	91
	75	TSP	48	151	126	34	41
	76	TSP	61	148	136	49	59
	77	TSP	58	290	149	45	55
	78	TSP	19	284	124	51	68
	79	TSP	45	214	197	51	67
	80	TSP	55	630	204	61	78
		SO_2	5517	104	73	5	5
Dunn Center (rural)	79	TSP	4	37	17	16	19
		SO_2	1896	78	26	13	13
	80	TSP	33	58	52	22	25
		SO_2	7332	52	39	5	5
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
			Privately-Operated Impact Source Monitoring Sites:				
Ramp #1 Beulah	79	TSP	11	161	93	57	69
		SO_2	1403	78	65	5	5
	80	TSP	59	642	125	24	41
		SO_2	6250	81	63	5	5
Ramp #2 Beulah	79	TSP	11	76	74	42	47
		SO_2	1401	73	52	5	5
	80	TSP	57	613	156	25	45
		SO_2	6251	91	84	5	5
Ramp #3 Beulah	79	TSP	11	1000	114	85	158
		SO_2	1403	47	39	5	5
	80	TSP	58	141	96	26	34
		SO_2	6239	148	107	5	5
Ramp #4	79	TSP	11	121	120	70	81
		SO_2	1403	102	63	5	5
	80	TSP	41	523	161	24	45
		SO_2	4141	165	151	5	5
Ramp #5	79	TSP	11	129	89	45	56
		SO_2	1404	37	31	5	5
	80	TSP	59	707	126	21	41
		SO_2	6164	60	57	5	5
Coteau #1	80	TSP	45	572	134	26	46
Coteau #2	80	TSP	41	700	308	49	80
Coteau #3	80	TSP	29	815	206	41	80

*SOURCE - NORTH DAKOTA STATE DEPARTMENT OF HEALTH

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land would be modified during surface mining. Although most would be returned to its approximate original contour, difference in detail would remain, including some variations in drainage patterns and the final sloped highwalls.

In general, the reshaped land would not be steep enough to cause slope failures and related hazards. Until natural vegetation can be reestablished, accelerated erosion would be a potential problem.

GEOLOGY AND MINERALS

The major impact of the leasing alternative would be the removal of 411 million tons of coal. Mineral resource conflicts might occur between development of oil and gas and of the coal since there is slight potential for finding oil and gas on the tract.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management (BLM) planning efforts (URA, MFP) and the Draft West-Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts are the disruption of the present soil bodies with temporary loss of productivity, in addition to problems associated with erosion, compaction, soil removal, and replacement, and instability.

There would be an increase in erosion and compaction during soil handling phases of mining. However, these problems would not be completely new to the area because of some dryland agricultural activity that presently exists. About five percent of the tract is annually left bare of protective cover due to summer fallowing. These types of impacts will continue with or without the presence of an active mine.

Stripping of suitable soil material on the steep slopes which are common in the tract may be difficult. Extra care will be required to operate removal equipment so as to maximize the amount of suitable soil that is saved. Control of surface runoff will be very important during this time to avoid soil loss and sedimentation problems in the drainageways.

Even though the areas with steep slopes would probably be left more gently sloping with reclamation, there would be enough variation in relief to make protective measures such as mulching and seeding of quick growing cover crops extremely important. Otherwise, the newly replaced soil would be highly susceptible to erosion.

Some instability problems would probably appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenwald, 1980). If the required stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, however, instability impacts should be kept minimal.

The soils would be lost to the production of grass, forage, and grain over the short-term use (about ten years for each annual disturbance of 490 acres) of the tract for coal mining. This loss is occurring only on the active portion of the mine at any given time. Once in full operation, the total area out of production in any given year is estimated at 4,860 acres. Soils would be continuously replaced on mined out areas and brought back into production during the life of the mine (45 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research (SEA-AR) of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station (NDSU-AES) of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power, 1974). This would be especially important for the Renner tract because the extensive steep slopes will make mining and reclamation quite difficult and expensive.

Table 2 indicates that most landowners have sufficient acreage of soil rated "good" and "fair" for supplying cover soil material in surface-mine reclamation. However, there are four separate parcels that have nearly half or more of their acreage rated "poor." These may require a very intensive reclamation effort to ensure successful rehabilitation. Often a thin layer of topsoil can be salvaged from the "poor" soils. If better soils exist in the parcel of land, they can provide extra material to cover the area rated "poor." Twelve core drill holes put down by the Bureau of Reclamation as part of a special study in this tract indicate that the top portion of some of the overburden is suitable for use near the surface of reconstructed soil profiles. If enough suitable plant growth material from the above mentioned sources can be averaged over parcels with soils rated "poor," it should be possible to increase their productivity.

HYDROLOGY

During mining, all of the surface runoff from the disturbed area must be impounded and not released until it meets specified quality standards. An exception to this is when storm runoff exceeds the design capacity of the reservoir. Water that collects in open mine pits is also often pumped into these surface water reservoirs. While these runoff catchment basins are in place, total water yields would be decreased due to increased evaporation and infiltration at the reservoirs. Table 10 shows the maximum possible loss of yield for the watersheds draining this tract by assuming no surface water is released. The impact on local streams may be significant.

Water which is released from the impoundments would generally have less suspended solids, higher dissolved solids and higher sodium adsorption ratios. At this time it is impossible to predict exactly how much difference there would be in these constituents.

The Beulah Zap lignite forms the upper aquifer in this tract and is the minable lignite bed. The initial mining would take place at the lower part of the lignite aquifer system where it discharges to the upper Antelope Creek Aquifer. While the mine pits are open, water levels in the surrounding lignite would be drawn down. The extent of drawdown resulting from the open pit would vary across the tract. This impact would affect the lignite aquifer in the tract and also to the west of the tract. Drawdowns may also be noticed along the western edge of the upper zone of the Antelope Creek aquifer.

The flow pattern of groundwater through the area would also be disrupted. The open pit would act as a groundwater sink. During mining this effect limits all groundwater quantity and quality impacts to the area included within this cone of depression around the open pit. Water levels over the entire tract and adjacent areas will not change everywhere at once. It would be a progression as mining moves from east to west.

Once the overburden is replaced in the pit, the drawdown stress would begin to subside and approach a post mining equilibrium. The flow patterns of groundwater would be different from premining patterns. Generally, water availability from the replaced overburden would be less than that from unmined areas.

The physical disturbance caused by a mining action can also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenewold (1979 and 1980) at other mines in North Dakota with similar overburden. These changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden and the Lignite down gradient would be similarly degraded. As water moves through the system away from the mined area, it would be diluted by relatively fresh recharge water from unmined areas. Studies to date have not found altered water quality further than about two miles away from mined areas. It is not known exactly what the real extent of this impact would be in the long term.

The irrigation and industrial water source will not be significantly impacted. There are between 25 and 75 water wells that are used for domestic and livestock purposes that may experience water level drawdowns at some point in the mine's lifetime. Between 20 and 60 water wells used for domestic or stockwater supplies could experience the water quality impacts discussed above. Replacement water supplies are available in similar quantity and quality in the lower Sentinel Butte sand.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 490 acres of the total tract per year from its current uses. The major use of these lands is agricultural production. The first land taken out of agricultural operations will occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 45 year period.

Mining of any one location would be the land use for one to five years depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission

TABLE 10
MAXIMUM LOSS OF WATER YIELD FROM THE RENNER TRACT

Watershed	Area to be Disturbed (acres)	% Watershed to be Disturbed	Maximum Water Yield Reduction (acre feet/yr)	% Reduction in Flow
Direct Trib. Lake Sakakawea	7,709	73	642	73
Trib. to Antelope Creek	10,505	58	875	58
Direct Trib. Spring Creek	9,651	52	804	52

agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing topsoil.

The company would be under bond for at least ten years to as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored to equal or better than it was before mining (Public Service Commission, Reclamation Department, 1980).

Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service (SEA-AR) and the North Dakota State University—Agricultural Experiment Station (NDSU-AES) indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing and development alternative would have a significant short-term impact on individual agricultural operations in the tract. By the end of the mine life, 22,072 acres of the tract would be disturbed in addition to 160 surface acres used for existing mine facilities.

An average of 83 acres of cropland, excluding summer fallow, would be removed from production each year. This would be an average annual loss of 2,083 bushels of wheat. This 83 acres of cropland would be out of production ten years with a maximum of 808 acres out of production in any one peak mining year, resulting in a maximum loss of 20,202 bushels of wheat annually.

Peak mining years disturbance of 374 acres of non-cropped hayland would result in an annual loss of 505 tons of hay production.

An average of 348 acres of rangeland would also be removed from production each year, resulting in an average loss of 174 AUMs. This 348 acres of rangeland would be out of production ten years with a maximum of 3,446 acres out of production in any one peak mining year, resulting in a maximum annual loss of 1,723 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The acreage data may not completely represent the logical mining unit in its final form.

In reestablishing native-type range, it is likely that some introduced species will be used. The laws require that introduced species be of the same seasonal variety and of equal or superior utility as the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The leasing of additional area would displace use within the tract boundaries. Transportation facilities and utilities would either be bypassed or relocated. Relocation would cause short lived inconvenience without long term impact.

The effect of leasing on nearby communities would be negligible but would extend the existing situation through a longer period of time.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) would damage recreational hunting. From the recreation perspective, it is likely the loss would be manageable.

Social and economic studies have documented demographic changes resulting from mining that would stress other communities in the vicinity of the tract. This stress would be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure will be seen on private and public land because of recreational opportunities lost to mining.

AESTHETICS

Coal development on the Renner Tract would be screened by favorable land forms from the closest population center, Zap, and would have a negligible affect on the scenery seen by residents.

Views from roads, however, would not benefit from screening and much of the Renner tract would be visible for reasonably long periods of time (four minutes or more at normal highway speeds) from the westbound lane of State Highway 200. Considering existing land use and the presence of coal mining and other visible disturbance in the area, this would not be unexpected either by local residents or those travelling through the area. Until the area is reclaimed the alteration of the visual surface of the area represents a loss of amenity for the duration of mining activity.

Several existing roads traverse the tract and may be relocated. Two of these roads are used for access to Lake Sakakawea for recreation. If these roads are not relocated or if relocation is made to locations close to the tract, views and vistas to the tract would be undesirable and would represent a loss of amenity affecting the recreation experiences for some users.

WILDLIFE

Coal mining and attendant actions would severely disrupt and possibly destroy significant native woodlands, and riparian wetlands interspersed with native prairie which singly and in composite constitute the essential habitats for 31 wildlife species and many other more common wildlife species.

On-site effects to wildlife resources would be degradation and at least short-term loss of the three essential habitats. Off-site aquatic habitats in the Missouri River and its tributaries and Garrison Reservoir would be the recipient of potential point and non-point pollution.

The disturbed agricultural areas are of low wildlife habitat value but do provide spring and fall feeding and loafing habitat for migratory waterfowl and shorebirds.

The areas identified on Map 3 (Chapter 1) are those which represent the highest sensitive wildlife habitats. The four mile wide belt north of Spring Creek is the area where the least wildlife habitat losses would occur due to strip mining if full compensation in kind is received.

There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodland, and native prairie and they are not replaced in full (compensation) or are converted to farmland.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparian woodlands and wetlands would restrict, and many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust, and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period.

Increased human populations resultant of mine development and operations generally reduce wildlife populations and habitat locally and off-site by poaching, road kills, increased legal harvest, disturbance of reproductive and migratory periods and habitats, harassment by recreationists, feral and uncontrolled cats, dogs, and degradation and complete loss of habitat due to housing, shopping centers, waste treatment plants, and similar urban development. The problem is compounded in areas where shift changes or workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjusting the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement and adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Successful reclamation of native prairie species mixes has yet to be fully demonstrated, although some prairie plowed about 70 years ago and since left undisturbed shows some evidence of native plant reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the lesser negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands might be a permanent loss.

At present no information exists as to the potential reclaimability of natural, biologically viable wetlands (e.g., potholes) in North Dakota. It would be most productive and conservative to eliminate mining from the larger wetlands (e.g., 1/2-acre and greater) thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable committment of wildlife resources.

An interagency team of Wildlife Biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter 1). Formal recommendations have been received by BLM from both agencies. Joint agreement between the agencies and final decisions on unsuitability, exemptions such as producing leases, and exceptions will be completed in August 1981.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

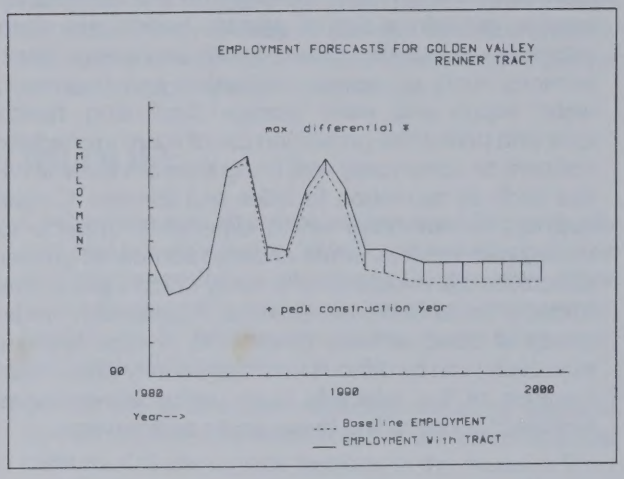
Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. These secondary impacts can include vandalism increased by improved access, loss as a result of erosion or degradation resulting from disruption or natural setting.

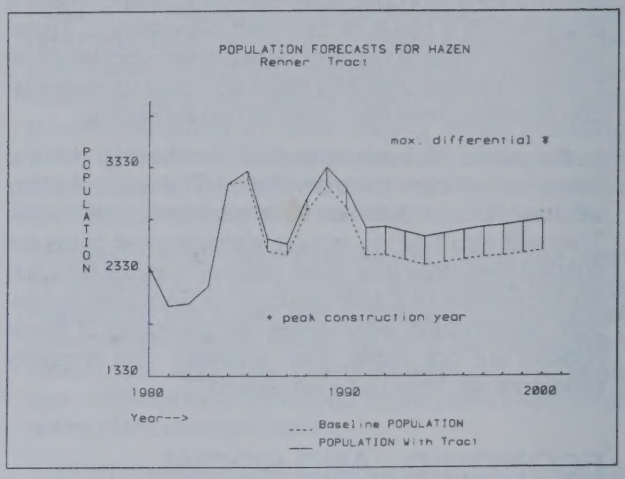
In the event of lease, stipulations covering cultural resources will have to be developed. These stipulations will have to treat both recorded and unrecorded sites. They will also have to require management plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these options are not viable, then scientific data recovery programs will have to be developed.

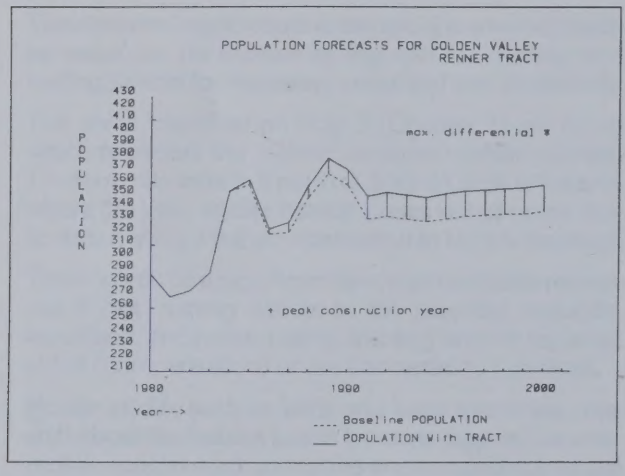
ECONOMIC AND SOCIAL CONDITIONS

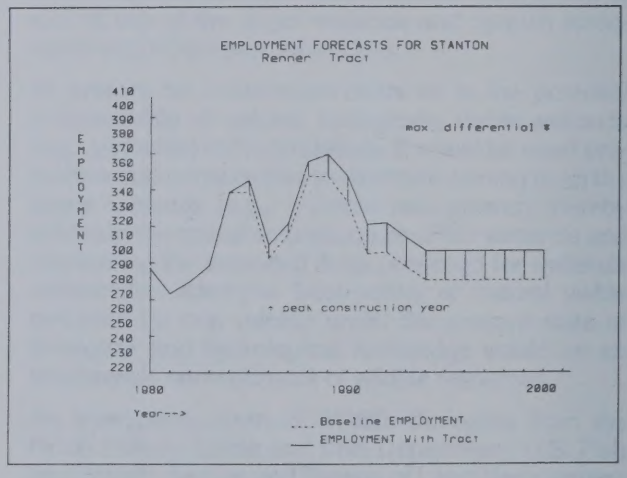
Several of the services appearing in the community service groupings are of greater importance than others in maintaining public health and safety. Basic services such as sewage collection and treatment, water supply and water storage/distribution, health care and police/fire protection are of more immediate concern to community well-being than are basic services such as recreation facilities and libraries. Consequently, communities which experience impacts to these basic services would undergo somewhat greater difficulties than would a community which experiences impacts on its non-basic services. Additionally, inadequacy of basic services (water and sewage systems especially) can be difficult for a community to deal with because of the relatively large capital expenditures required for upgrading these plants and services.

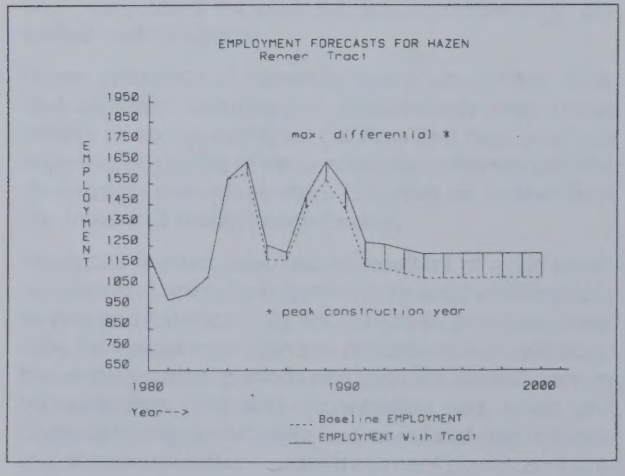
FIGURE 3 (continued)

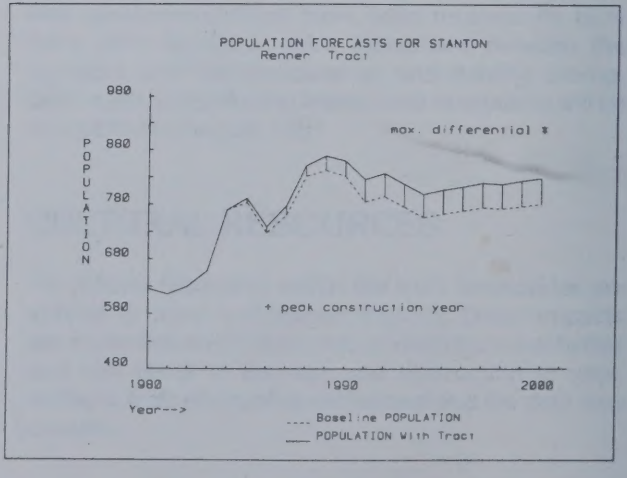












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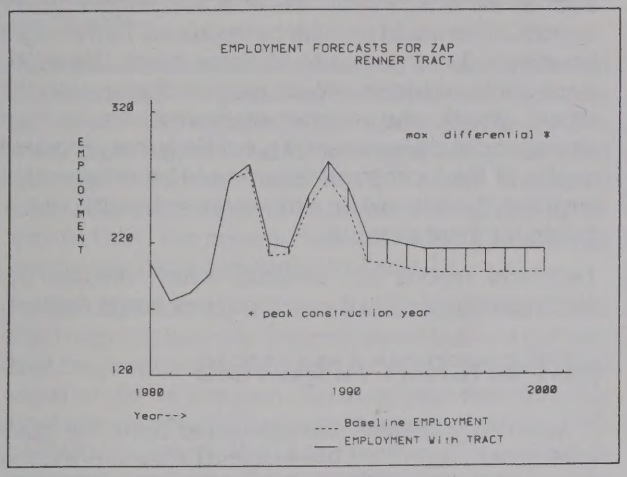
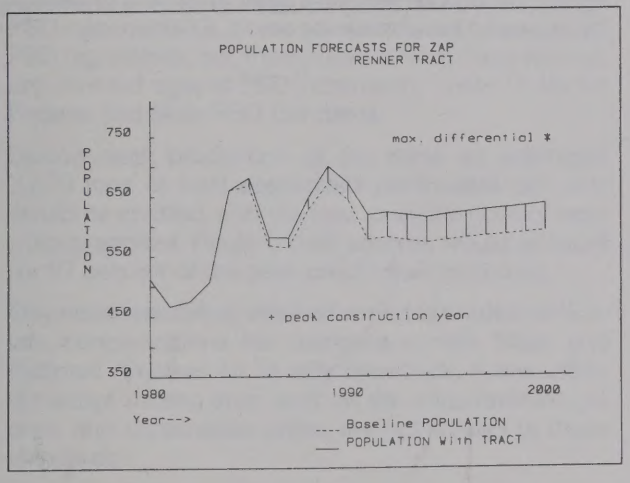


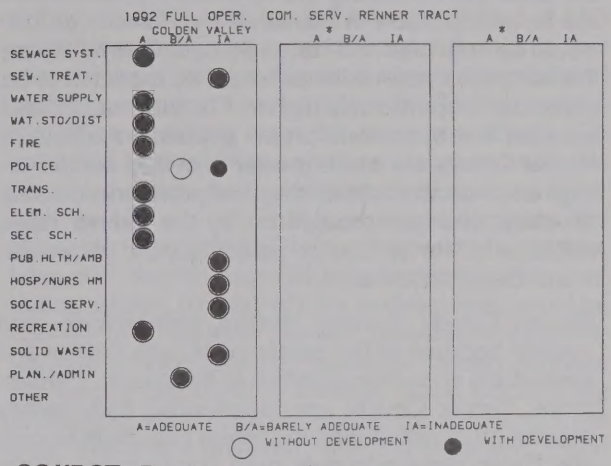


SOURCE: Mountain West Research, Inc., 1981.

Statements made regarding community service adequacy with population increases and adequacy ratings appearing in Figure 4 reflect assessments by county planners. It should be recognized that best judgments were made concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1986 and 1992.

Changes in regional personal income from tract development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditure and through company expenditures for goods and services during the construction and operation phases.

FIGURE 4



SOURCE: Respective city/county or regional planners.

There appear to be three factors that are critical in mitigating many of the adverse economic impacts due to coal related population growth. One factor is that the community have adequate lead time to prepare for the increased population before the major population influx occurs. The second crucial mitigation factor is the availability of planning expertise to assist the community in designing and implementing a planning strategy to accommodate the increased population. The third factor is adequate financial assistance to carry out the needed community service improvements in a timely manner.

The Bureau of Land Management can make recommendations regarding leasing dates to allow lead time for community planning. The Regional Coal Team and Secretary of Interior can also recommend certain leasing dates. The Bureau recommendations on leasing dates will be made during the environmental impact statement phase after tract ranking has occurred.

The affected counties and communities may be able to obtain planning and financial assistance through state agencies such as the North Dakota Energy Impact Office and federal agencies such as the Farmers Home Administration and Department of Housing and Urban Development. At this time, it is not known if the impacted communities will actually be able to acquire the needed planning and financial assistance. This is dependent upon Congressional budgeting action and total demand for energy impact assistance.

In terms of absolute population changes that would be brought on by opening and constructing the Renner mine, the Bismarck-Mandan area in Burleigh and Morton counties would receive well over one half of the total population. However, because these two cities have large population bases relative to other communities in

the area, effects during the operations phase would not be as noticeable in Bismarck and Mandan as they would be in Beulah and Hazen (Mercer County) where the number of new residents would be expected to be lower but proportionally higher. For this reason, and because the operations phase population effects in Mercer County are much greater than they are in Burleigh and Morton counties, the most pronounced social structural changes brought on by the Renner mine would be in Mercer County, particularly the communities of Beulah and Hazen.

Mercer County is fairly diverse economically and socially because of the existence of both energy and agricultural economic activities in the county. Furthermore, Mercer County has experienced fairly steady population growth during the recent past. Both Beulah and Hazen are moderately sized communities where considerable coal development, both mining and plant construction, and operation has occurred. For these reasons it seems as though opening and operating the

Negative area characteristics as perceived by residents such as the lack of retail, medical, and entertainment opportunities would possibly be improved. Firms might be attracted to the area to fill these needs. However, since some residents already express dismay with the recent growth, the number of newcomers, and an altered social environment, it is not likely that perceived quality of life for the residents would be enhanced. If anything, there would be a minor but noticeable degradation for these persons.

Technical reports are available which discuss the methodology used in the economic or social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, [illegible]

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 11.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment). Table 12 shows Federal and State PSD standards.

During peak production of the mine an estimated 3,870 tons of total suspended particulates per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 5 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 17.6 ug/m^3. This level would consume the allowable Class II PSD annual increment for particulates. With the annual background concentration added (22 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 6 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 139 ug/m^3. This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 239 ug/m^3. This level exceeds the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standard. A violation would occur if the ambient air standard was exceeded more than once per year. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (1 ug/m^3-annual; 5 ug/m^3-24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions from mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 11
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standards)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 11 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

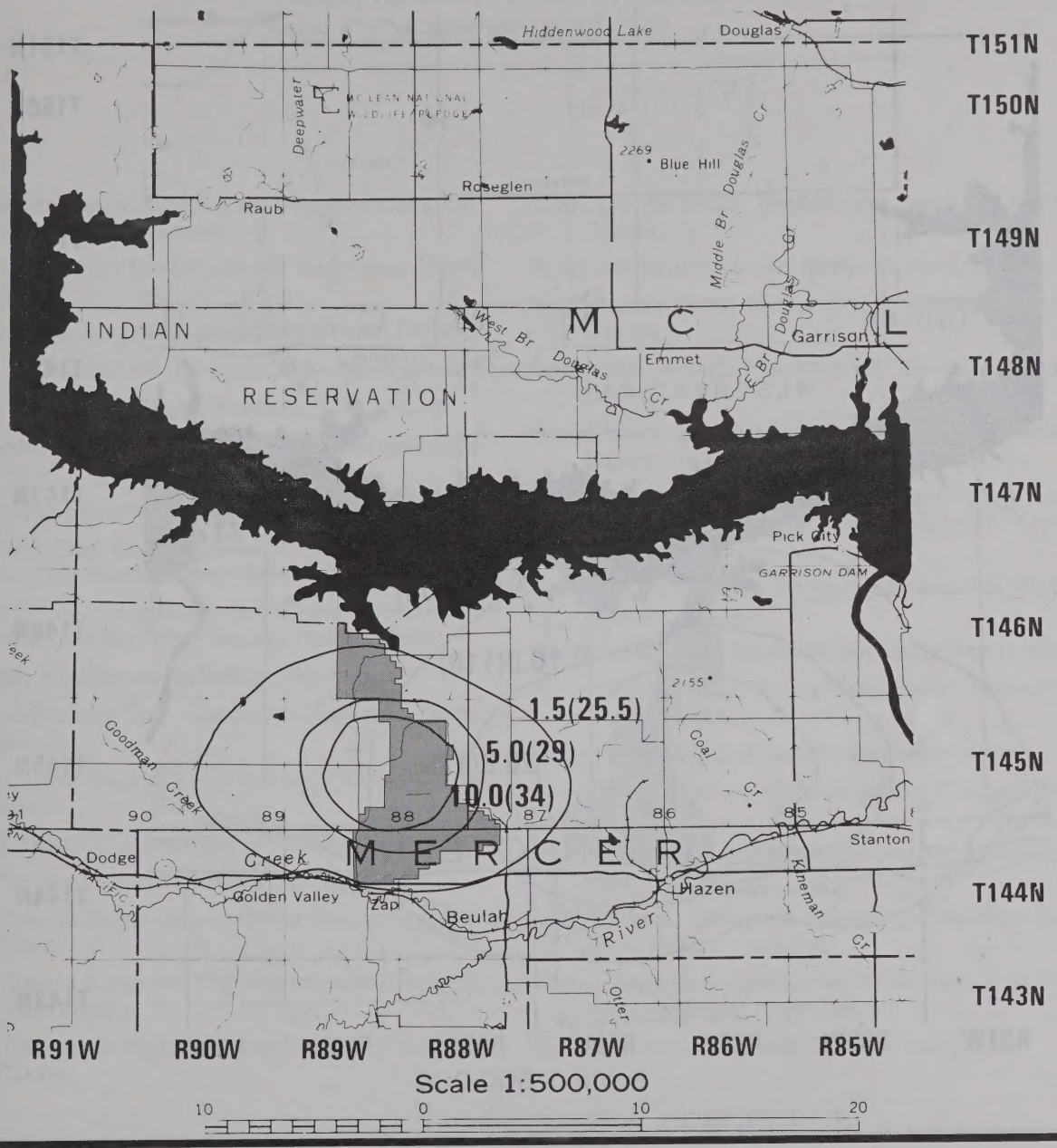
TABLE 12
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC
Requirement for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.



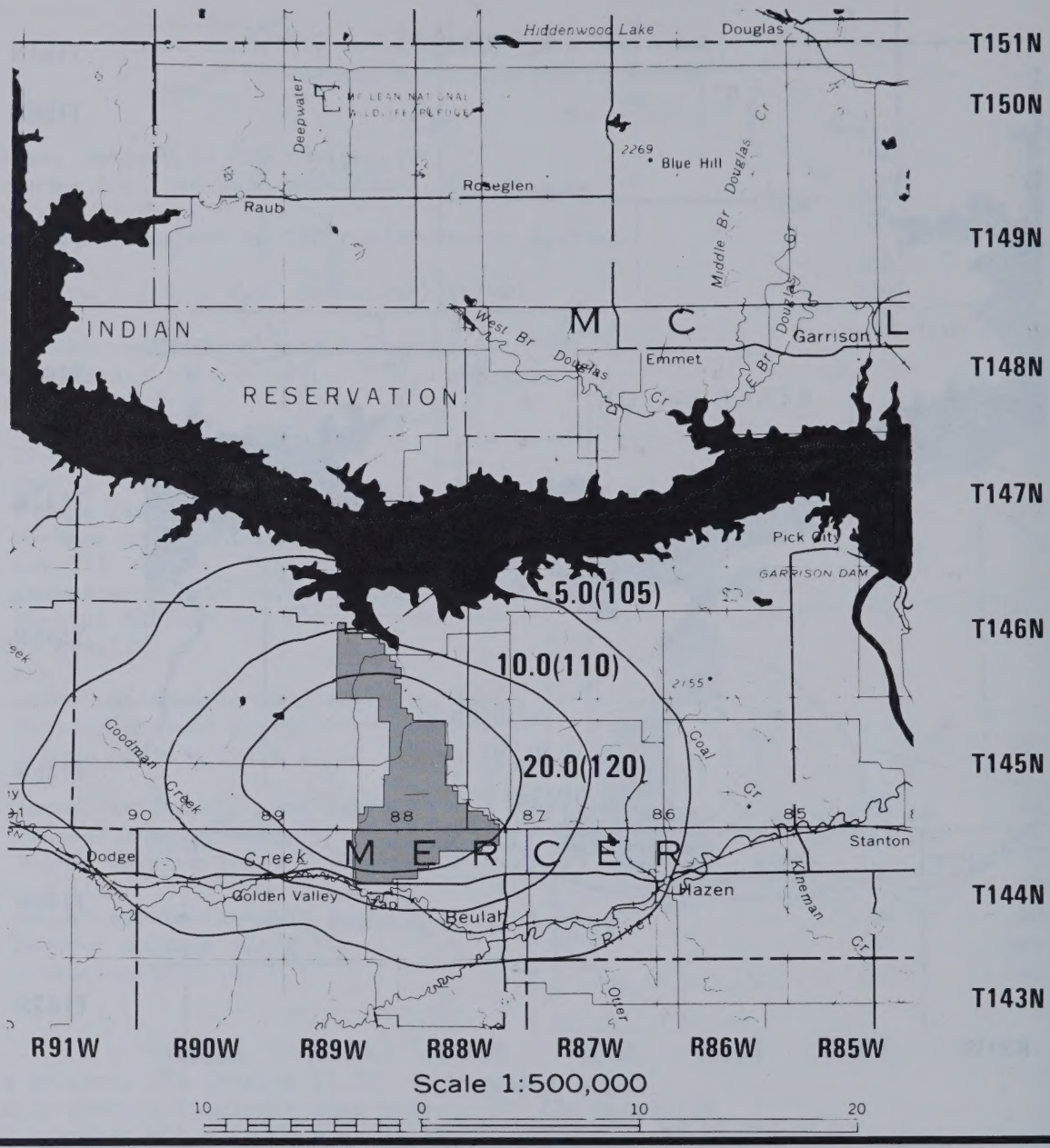
Renner Tract

N

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5



Renner Tract

N

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 6

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

Mercer County Agricultural, Stabilization and Conservation Service Office; Beulah, North Dakota.

Mountain West Research; Billings, Montana.

North American Coal Company; Bismarck, North Dakota.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service; Bismarck, North Dakota.

United States Geological Survey, Conservation Division; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Dakota.

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SUMMARY MATRIX
RENNER TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATION

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Rolling upland.	Less contrasting topography with slight modifications of drainage patterns.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified	None	N/A	Good	
Potential for Other Minerals	Low (Oil and Gas) - this tract is located in the Williston Basin.	Low - There has been exploration activity in the area.	Mining could interfere with development of the oil and gas.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potential	Wind - Low to mod over most of the tract. Water - Mod to high over most of tract.	Increase with soil handling operations but little overall change.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None	There has not been a need for this data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to: Untreated steel - High; Concrete - Low	None	None	Outstanding	
Highly Saline/ Sodic Soil Conditions	There are a few small scattered areas of these soils in the tract.	These areas can possibly be improved through mining by replacing with better plant growth material from surrounding soils and/or the overburden.	Minimal	Outstanding	
Character of Subsurface Materials and/or Interburden	Twelve drill holes in the tract as part of an EMRIA Study. Data indicates that often the top 10 to 20 feet and sometimes as much as 50 to 80 feet of the overburden is suitable for use in reconstructing soil profiles. The remainder has high salinity and/or sodicity, high pH, and high clay content.	Some instability problems (settling, piping) may appear with the onset of reclamation. Some of the overburden could be used to improve areas with soils rated "poor" for final cover of surface-mined land.	Minimal	Outstanding	
Reclamation Potential					

Based on soil suitability for final cover of surface mined land, the chance for successful reclamation of most individual landowner holdings and for the tract as a whole appears to be high. However, there are four separate parcels that have nearly half or more of their acreage rated "poor". These may require a very intensive reclamation effort to ensure successful rehabilitation.

The entire mining process including reclamation will probably be quite difficult and expensive on the extensive steeply sloping areas in this tract.

The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 10,293 acres, 44%; "Fair" - 10,669 acres, 46%; and "Poor" - 2,278 acres, 10%.

Precipitation could be a limiting factor for reestablishing vegetative cover some years.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Drawdown of Shallow Groundwater Levels	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Wells finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Will affect between 25 and 75 wells used for domestic and livestock purposes.	Hydrology - Acceptable Well Inventory - Acceptable	This will be a short-term impact that will only occur to a few wells at a time as through the tract.
Degradation of Groundwater Quality	Lignite water does not meet Public Health Service drinking water quality standards. It is acceptable for domestic and stock water purposes since it is the best practical source.	Groundwater quality will be degraded in the tract and this impact can move down gradient into the surrounding unmined aquifer.	Will affect between 20 and 60 wells used for domestic and livestock purposes.	Hydrology - Acceptable Well Inventory - Acceptable Impact Prediction - Acceptable	The long-term impact of how far down gradient poor water quality will move is not known.
Vegetation					
Cropland	There are 3673 acres of land in the tract that are currently being cropped.	Average annual loss of 83 acres excluding 1033 total acres of summer fallow. Annual production on this 83 acres would be 2083 bu. of wheat. Maximum loss in any one peak mining year would be 808 acres and 20,202 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	
Rangeland	Average annual production is 7833 AUMs.	Average annual loss of 174 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 3446 acres and 1723 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Agriculture	There are 40 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long-term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	39% of the involved operators' acreage is in the tract.			Outstanding	
	26% of the acreage of the tract is operated by lessee's.	Nonowners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Threatened or Endangered Species	There are no threatened or endangered species (on the Federal List) in the tract.	None	None	Good	
Agricultural Economics	Assessment not scheduled for completion until August.				
Land Use	Agricultural use. Local utilities and minor roads. A portion of Highway 200. Existing mining in the vicinity.	Displacement of existing use in short term. Relocation or bypass of utilities and roads. No long term impact. Perpetuation of existing use.	See Vegetation and Agriculture sections. Minor inconvenience.	Acceptable	
Recreation Values	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Endangered Plant Species	None identified.				

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Aesthetics	Agricultural, dynamic mining and related activity in the vicinity. Little of the tract is visible from Zap, but highly visible from State Highway 200. Low value as scenery; aesthetic value is moderate.	Short term changes in views from agricultural to mining disturbance on State Highway 200. Change is fitting with the region. With reclamation, no long term impacts.	Moderate to low short term significance. Insignificant in long term.	Acceptable	
Wildlife					
Sensitive Wildlife and Essential Habitats	Sensitive wildlife habitat - 30-70% of the areas for 30 sensitive wildlife species. Whooping crane and northern swift fox are identified with the area.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 sensitive wildlife and many more common wildlife. Offsite aquatic habitats of Otter, Coyote, Brush, and Spring Creeks, the Knife and Missouri Rivers, and the Garrison Reservoir would be recipients of potential point and nonpoint pollution.	There will be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGP, and BLM Biologists). Wildlife data quality is high.	To date there are no data to direct successful recreation (compensation) native woodlands and wetlands after strip mining in this country. Native prairie comprised of native plant species has not been recreated from mine spoil. If some forms of habitat replacement is achieved during mining and thereafter, then the negative impacts to wildlife resources would be proportional to the successful compensation.
General					Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled, it would significantly reduce recreation opportunities.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Cultural/ Historical Values	Sample surveys are complete. Recorded cultural resources will not affect coal mining.	Loss of sites as a result of mining activity.	Anticipated impact is not great because resources can be mitigated through data recovery.	Good	None
Net Energy Analysis	No fossil fuels are being produced from this tract at this time.	A total of 9.0 million tons of coal (1.6 million tons of federal coal) will be produced annually. (These figures include all federal coal).	Production: 6929 Btu/lb. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption: 184:1	Acceptable	
Climate and Air Quality	Good	Possibility that proposed action could violate State and Federal ambient TSP standards. Totally consumes the allowable class II PSD increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly ($1ug/m^3$ - annually; $5ug/m^3$ - 24-hour) to the PSD's class II annual or 24-hour particulate increment.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
		Social and Economic Considerations			
Employment	Communities of Beulah, Golden Valley, Hazen, Stanton, and Zap, North Dakota have one or more inadequate services with present employment/ population.	Employment increases will occur in Beulah, Golden Valley, Hazen, Stanton, and Zap.	Moderate employment changes.	Outstanding	
Population	Communities of Beulah, Golden Valley, Hazen, Stanton, and Zap, North Dakota have one or more inadequate services with present population.	Population increases will occur in Beulah, Golden Valley, Hazen, Stanton, and Zap.	Moderate population changes.	Outstanding	
Regional Income	$4,560 estimated regional income per capita.	Minor increases in per capita income.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Beulah - 2 inadequate services Golden Valley - 3 inadequate services Hazen - 1 inadequate service Stanton - 2 inadequate services Zap - 3 inadequate services	1992 Full Operation Golden Valley with tract - 6 inadequate services w/o tract - 5 inadequate Tract related population growth would result in no public services becoming inadequate in the communities of: - Beulah - Hazen - Stanton - Zap	Since police services are essential for maintaining public safety, the impact would be somewhat significant.	Good	Community services which are inadequate without tract related population growth would experience additional strains due to increased demands on an already inadequate service situation. Based on assessment of 15 community services.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Perceptions of Services	Mercer County - Law enforcement, shortage of Recreation Facilities, Medical Care, and Retail opportunities were identified as service problems.	Not applicable	Not applicable	Acceptable	
Social Attitudes	Mercer County - 17 interviewees Residents - approximately 3/4 expressed support for coal mining. Officials - approximately 3/4 expressed support for coal mining. Stated concerns - Relationships between coal companies and landowners, access to adequate revenues, adequate education resources, changed pace of life, air pollution, successful reclamation.	Not applicable	Not applicable	Acceptable	
Quality of Life	Mercer County Favorable characteristics - outdoor recreation opportunities - attached to the land - uncrowded, unstressful, and in formal social environment. Unfavorable characteristics - climate, destruction of top quality agricultural lands, lack of retail, entertainment, and medical opportunities.	Relationships with people would be jeopardized since Renners Mine would represent one more source of segmentation and increased formality. - Minor but noticeable degradation. Degradation in perceived quality of life.	Noticeable effects in Mercer County and Burleigh/Morton Counties.	Acceptable	

RENNER TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land system	No	---	---	---
2. Rights-of-Way and easements	No	---	Nc	---
3. Buffer zones	Yes	No	No	Exceptions may be applied at mine plan.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	No	---	No	---
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Whooping Crane and Northern Swift Fox known or believed to use these regions.	---	Swift Fox data very limited.	Exclusion of strip mining from wetlands will protect most whooping crane areas.

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
10. State listed endangered species	No	---	No	Does not exist.
11. Eagle nests	No	---	No	---
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	No	---	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	Does not exist.

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